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BIRD RANGE DYNAMICS

TRACKING THE RANGE EXPANSION OF THE MARICO SUNBIRD *CINNYRIS MARIQUENSIS* IN SOUTH AFRICA THROUGH SABAP2

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The Marico Sunbird *Cinnyris mariquensis* is a species that is usually confined to dry *Acacia* savanna and broad-leaved and riparian woodlands (Bowie 2005, Skead 1967). Herremans (1997) noted it as an *Acacia* thornveld specialist and Skead (1967) and Maclean (1987) commented that it is associated with riparian vegetation in arid regions. A large proportion of its range is centred in the drier central and western regions within southern Africa but it also occurs in the wetter sub-tropical woodlands in the eastern parts of the country. It is usually regarded as a sedentary and resident species; movements are largely unknown (Bowie 2005). It is an active sunbird that feeds in association with other conspecifics including White-bellied Sunbird *C. talatala* and Dusky Sunbird *C. fuscus* (Skead 1967, pers. obs.). This paper describes how the range is expanding into the Northern Cape and Free State provinces in central South Africa.

New records in central South Africa

On 30 July 2016, I observed an ‘all dark’ sunbird in the Alex Hall Memorial Gardens (AHMG) at the McGregor Museum, Kimberley (28.748°S, 24.780°E, pentad 2840_2445). The AHMG has large patches of planted *Aloe* spp. and the bird was seen flitting between patches. Due to the birds’ active habits and time limitations no positive identification was possible; it was most likely a Marico Sunbird based on colouration and being the only ‘dark’ sunbird close to Kimberley.



Figure 1. Male Marico Sunbird in the Alex Hall Memorial Gardens, McGregor Museum, Kimberley, on 9 August 2016 (Photo DM Harebottle)

On 9 August 2016, during a bird ringing session at the gardens, a positive identification was made and photographs taken (Figure 1). After consultation with Mark Anderson and Eric Hermann (ex Northern Cape ornithologists, *in litt.*) this was confirmed as the first documented record of Marico Sunbird in Kimberley. Eric commented that he usually “only associated the species around the Kuruman area and northwards”. Both records were subsequently submitted to the second Southern African Bird Atlas Project (SABAP2), were vetted and deemed as out of range based on current distribution records for the species. The records were later verified. It was later discovered that the sunbirds had been recorded in AHMG towards the end of winter in 2013 and see again in the winters of 2014 and 2015 (B. Wilson *in litt.*); these records were not documented but were confirmed.



Figure 2. Male Marico Sunbird, Ria Huysamen Aloe Garden, Prieska, Northern Cape, 15 August 2016 (Photo DM Harebottle)

On 15 August 2016, three males in full breeding plumage and a female were seen and photographed in the Ria Huysamen Aloe Garden (RHAG) in Prieska (N. Spangenberg and DMH) (Figure 2). These were the first known records in Prieska, and also for SABAP2 pentad 2940_2245, in which the garden is located. The record was submitted to SABAP2 and subsequent vetting confirmed the identity as Marico Sunbirds.

There is a further record of a bird recorded and verified from pentad 3045_2225 (30.771S, 22.480E) on 29 August 2016 (A. van Vuuren *in litt.*). This is c. 40 km from Carnarvon on the road to Vosburg and is approximately 120 km from the closest records to the north in Prieska. The bird was seen in tall-flowering plants along a drainage line and described as “a sunbird with black underparts and very iridescent-green head and mantle, and maroon-purple chest-band”.

The above records raised the question of a notable southward range expansion of Marico Sunbird from the limits of its known range to the north of these localities, and prompted a more detailed investigation of the range expansion of this species in South Africa.

Range changes since SABAP1

The current range change map for Marico Sunbird, which compares SABAP1 and SABAP2 distribution and relative abundance over a 20–25 year period, shows a pattern of new records to the south, southwest and west of its core inland distribution, centred on Kuruman (Figure 3). Up until the RHAG records in Prieska, the southernmost record was of a bird observed in pentad 2920_2240 in July 2009 about 30 km north of Prieska; this represented a distance of approximately 50–60 km (straight-line distance) from the closest known range for Marico Sunbird. The record near Carnarvon now represents the most southerly record of Marico Sunbird in South Africa, and notably in central South Africa. The range-change map in itself is interesting because the changes in relative abundance as evidenced by reporting rates in both projects suggest large decreases in abundance to the north of Kuruman, an area where the species was regularly reported in the past and known as a core part of its western range in South Africa (SABAP1, E. Hermann *in litt.*)

It should be noted that there are a number of unconfirmed records within a 50 km radius of Kimberley: one to the east of Barkly West in pentad 2825_2440, one in 2845_2435 which was reportedly seen in Marrick Game Farm (T. White pers. comm.) and one record from Mokala National Park in pentad 2905_2420. These were all submitted to SABAP2 but have yet to be verified.

Operating in the part of the Northern Cape north of the Orange River, Parker (2016) has also listed the Marico Sunbird as a species undergoing range expansion since SABAP1.

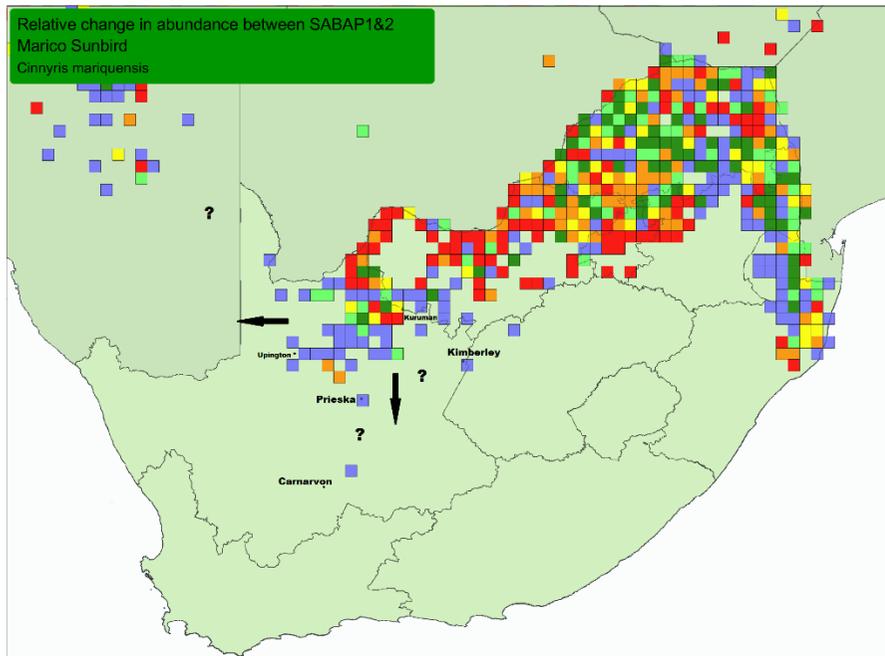


Figure 3. Range-change map between SABAP1 and SABAP2 for the Marico Sunbird. RED, ORANGE and YELLOW represent quarter-degree grid cells with large, moderate, and small relative decreases and BLUE, DARK GREEN and LIGHT GREEN represent grid cells with large, moderate and small relative increases. The arrows indicate the directions of possible future expansion, and the question mark indicates gap areas in which the species possibly occurs. Adapted from a map supplied by Animal Demography Unit, University of Cape Town. Fuller information on the interpretation of this range-change map is provided in Underhill & Brooks (2016).

In addition, there are two records from the north-western Free State; birds seen in pentad 2745_2545 on 10 and 11 April 2009. This is the first documented record of Marico Sunbird in the Free State. The pentad occupies most of the southern section of Sandveld Nature

Reserve, and situated close to Hoopstad. This record is equidistant (c. 75 km) from Hartswater and Schweizer-Reineke, the closest pentads which have verified records for this species. There are only three full protocol cards for pentad 2745_2545, all from April 2009, so reporting rates cannot be meaningfully interpreted.

There are also records around Upington (pentad 2825_2110) which show a 'westward' expansion. To the southwest Marico Sunbird has been recorded in 2835_2105, while to the north and northwest four pentads (2800_2100, 2700_2050, 2700_2125 and 2700_2140) have confirmed records and infer some movement 'west' of Upington. Perhaps the most interesting record is one in Twee Rivieren, Kgalagadi Transfronteir Park (2625_2035); this is the most westerly record to date in South Africa. The Twee Rivieren record represents a gap of over 75 km from the western edge of its known range prior to SABAP2. This 'westwards' movement shows birds moving into drier, more arid areas with the Northern Cape.

In the eastern parts of its range, in northern KwaZulu-Natal, there are also seems to be some movement southwards. There is an unconfirmed record in pentad 2850_3125. This is in the Eshowe pentad and was recorded around Dlinza Forest. This represents a gap of 40-50 km from the closest edge of its range to the north, around Mtubatuba.

Why are Marico Sunbirds moving?

I will focus on the range expansion of Marico Sunbirds into the Northern Cape and Free State, i.e. the drier western parts of its range in South Africa. Although there are limited 'range expansion' records, the range change map (based on changes in relative abundance) does show interesting changes to the species distribution in central South Africa. Although records point to range expansion, the question is why? It is probably feasible to say that the following contributing

factors may explain these patterns and resultant expansion of range-edges that can be seen in SABAP2 (Figure 3).

Access to food resources

Birds will usually move to find food and often this is tied to seasonal availability (Maclean 1990, Sutherland et al. 2004). For sunbirds access to nectar reserves is vital to replenish energy spent during foraging haunts (Skead 1967). Flowering plants not only provide nectar but also attract insects which are important protein sources for sunbirds, especially when they are feeding chicks. Landscaped areas and gardens in towns and sometimes at farm houses provide rich nectar sources away from natural patches and birds will actively seek these out. The arrival of birds at the AHMG in Kimberley confirms this to be the case. Males will also actively defend nectar patches (Bowie 2005), even in small areas such as the RHAG in Prieska (pers. obs) and this may well drive out competing males and/or females.

But what about during summer? Can these birds sustain themselves in these newly colonised areas when winter flowering season ends? Are there enough summer flowering species or do they leave and seek out other flowering opportunities elsewhere? These are questions warranting further investigation.

Changing weather patterns

Birds will also move if weather conditions change or in response to environmental stress conditions (de Villiers 2009, Stevens *et al.* 2015). Droughts usually act as a catalyst for many species to move in search of wetter areas or where resources are more favourable. Similarly, floods or wet conditions can also lead to increased movement as birds, particularly waterbirds, disperse over a more widespread area to take advantage of an increased food supply (Harebottle 2012). Since 2014 a severe drought has ravaged large parts of South Africa, with lower

than average rainfall falling over the western and central regions of South Africa (South African Weather Service 2016, Merten 2016). The drier than usual conditions in these regions may have been a catalyst for Marico Sunbirds to venture southwards. Herremans (1992) noted that Marico Sunbirds in Botswana moved out of the Kalahari during the dry season and during droughts possibly to Zimbabwe and even Mozambique. However, it is interesting that a species that already occupies a dry, semi-arid habitat in the central parts of its range would colonise drier and increasing treeless areas to the south within the Karoo, and even westwards into the Kalahari. Perhaps biological drivers such as physiology and behaviour (as suggested by McKechnie 2013), are playing more important roles for this species' expansion than environmental variables or climatic envelopes? This question also warrants further investigation.

Juvenile dispersal

Natural dispersal of juvenile and immature birds is a common phenomenon across many bird families (Brooke and Birkhead 1991, Sutherland et al. 2004). Young birds are usually forced out their natal sites by their parents or other adult birds. Depending on territory size, juveniles will set about finding unused sites in which to settle. Young birds may also be more adventurous, still learning landscape features and thus tend to venture longer-distances; a juvenile Marico Sunbird ringed near Rustenburg in the North West province was found to have moved 51 km (SAFRING, unpublished data) to the northeast, a substantial distance for such a small-sized bird. More ringing studies may well shed new light on dispersal patterns and distances of juvenile and even adult Marico Sunbirds in central South Africa.

Hop, Skip and Jump

One can postulate as to why these birds are moving, but until more evidence can be gathered the 'why' question will remain a theory.

Perhaps the more interesting question is: how do these small birds move ‘tens’ to ‘hundreds’ of kilometres? Birds, particularly diurnal migratory species, will usually follow natural landscape features such as rivers, hillsides or valleys to facilitate movement as these offer ideal channels and guides for movement. It seems probable that Marico Sunbirds make use of this mechanism to move in a certain direction and it is likely coupled with the occurrence of patches of similar habitat and/or food resources along these channels, for example, the presence of stands of flowering plants such as Aloes. An example is the Orange River that connects Groblershoop and Prieska and is an obvious route for the sunbirds to use, given its wooded riparian edge which support a myriad of flowering shrubs and trees. However, landscaped areas at farmhouses and gardens in towns may also play a role in acting as secondary habitats affording the birds additional foraging opportunities *en route*.

The coupling of the natural features and landscaped gardens could suggest a ‘hop-skip-jump’ or ‘leap-frog’ approach, birds using the natural features as a means to move (‘hop’) through the landscape and the gardens acting as longer, but temporary refuge areas (‘skip’) before they set out seeking other refuges or habitats. The ‘jump’ is the final act resulting in significant movement away from the edge of the known range. The fact that three males simultaneously made use of the Aloe garden in Prieska provides strong evidence of how these landscaped areas with dense stands of aloes and other flowering plants act as refuges for these sunbirds.

It is interesting that the westward expansion of these birds takes them into much drier landscapes with fewer trees; they tend to prefer some woodland as part of their habitat requirement (Bowie 2005, Herremans 1997). Occupying arid or semi-arid environments is however not something new for the species, given its occurrence in Namibia and Botswana. It will be interesting to see how far west the species continues to move and if a landscape or climatic threshold or boundary exists preventing further expansion.

The impact of SABAP2

This review has certainly shown that a project like SABAP2 and the technology developed to collect and display results in near real-time, adds enormous value in reflecting range changes over relatively short periods of time. Tracking these changes is critical in understanding not only how individual species are conquering new areas but also if similar patterns are evident in conspecifics or other species that occupy similar habitats or vegetation zones. But records need to be submitted to the project in order for changes to be documented and mapped, and comparisons made.

It is important to consider just how genuine the gap areas are? It seems likely that, due to the large inter-pentad distances seen in the range-change map (Figure 3). Marico Sunbirds may be more prevalent in these gap areas than the maps suggest. It is possible that they may well be under-reported; the so-called ‘false positive’ effect. The gaps in distribution might well be an artefact of poor coverage and this emphasises the need to continue mobilising birders and atlasers in poorly covered regions, such as the Northern Cape. Further concerted fieldwork expeditions are needed to (a) increase atlas coverage in the central parts of the Northern Cape and (b) focus attention on changing distributions of certain species. For the latter, a species-highlight approach will help gather additional data that will further elucidate the range changes in species such as the Marico Sunbird. The current resource base for SABAP2 (i.e. its citizen scientists), however, has proved that using a refined protocol instils an atlasing mind-set which increases submissions from atlasers even during once-off or infrequent visits to remote areas, i.e going on holiday or travelling through a certain area. The importance of submitting such *ad-hoc* or incidental records from these remote areas cannot be over-stated.

There are still lots of unknowns and knowledge gaps in determining the real causative factors pushing Marico Sunbirds southwards and westwards, but for now bird atlas data has given us first insights. More

atlas data are however needed to further elucidate these patterns, while intensive mark-recapture or logger studies are additional tools that can be used to collect actual information on movements. In light of global environmental change which is rapidly altering landscapes and ecosystems, it seems likely that this species may well be a good candidate for climate change impacts on nectarivorous species in central and western South Africa.

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